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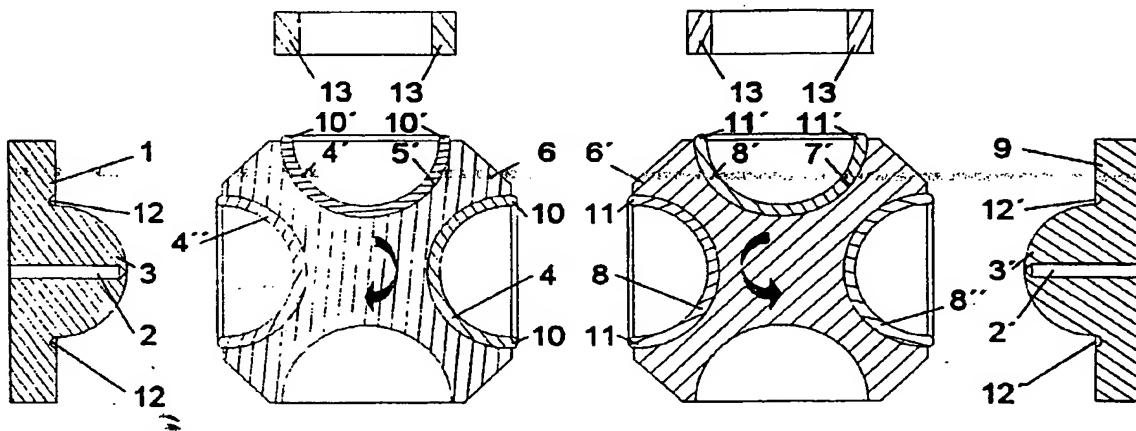
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(54) Title: PROCEDURE AND MACHINERY FOR THE MOLDING AND ASSEMBLING OF AN ASSEMBLED OBJECT

**WO 02/36319 A1**

(57) Abstract: The invention concerns a procedure and a machinery for molding and assembling of at least two part objects (4) and (8) of plastics, e.g. two ball shells, which can be assembled to a hollow ball (4+8), as molding and assembly can take place in the same tool and continuously in the same work procedure. This can be realized by the two turnable middle parts (6) and (6') of the tool, respectively are supplied with the mold cavities (5) and (7), where the assembling of the part objects (4) and (8) can take place, when the respective tool cavities meet during the rotation, at the same time as the closing of the mold. During the closing there can simultaneously be molded new part objects (4'') and (8'') in the opposite placed mold cavities (5'') and (7'') in the two turnable mold part (6) and (6'). If it is necessary in respect of the material or the design of the part objects, there can after the molding of the part objects be applied e.g. heat on the respective boundary surfaces, which shall shape the assembling. This can suitably be fit into the steps, which the turnable middle parts (6) and (6') run through. The part objects (4) and (8) can possibly as well as be assembled by a snap- or click function, which is a pure mechanical assembling.

## Procedure and machinery for the molding and assembling of an assembled object.

The invention concerns a procedure and machinery for molding and assembling of an in at least two part objects molded object preferably of plastics in a tool comprising at least one turnable and/or displaceable middle part.

There is known other procedures and machineries for the molding and assembling of plastic parts in tools with a turnable middle part. Thus there in my international patent application PCT No. DK/98/00034 are described turnable middle parts, which enables the use of the so called stack molding technique in multi component molding, where you mold assembled plastic parts.

For plastic objects, which normally cannot be molded with a cavity because of the shape of the core or of complicated geometries, you have at injection molding normally molded the object in two halves and assembled them afterwards outside the molding machine.

The hitherto known procedures and machineries for assembling or molding of such objects normally involve, that you apply assembling- and welding machines to achieve these objects with cavities, where it is not possible to achieve the desired geometries in another way than by using e.g. various blow molding techniques.

The procedure and the machinery according to the invention is intended to combine the above mentioned technology with the likewise known assembling technique, but here in one and the same tool, whereby there can be achieved large improvements of productivity.

The procedure according to the invention is characterized by the fact, that there in at least one of the boundary surfaces between the parts of the tool, which are furnished with turnable/displaceable tool cavities and/or cores, occurs an assembling of the parts e.g. by welding or another kind of assembling of at least two parts of the in the tool molded object(s).

A more precise account for the benefits by the procedure and machinery according to the invention will appear from the description and the drawing, where

Fig. 1 shows a cross section of the tool according to the invention seen from above,

Fig. 2 shows the same, where the turnable middle part is turned 90 degrees in the direction of the arrow,

Fig. 3 shows the same, where the middle part is turned additional 90 degrees, and

Fig. 4 shows the same, where the middle part is turned another additional 90 degrees.

On fig. 1 is, seen from above, shown a section of a tool for the exercise of the procedure according to the invention. From the left is seen the stationary tool part 1 with a hot-runner furnished inlet 2, which directs the material further through the core 3. The tool is on the figure just opened after the first part object 4 is molded in the cavity 5 in the left of the two turnable middle parts 6 through the inlet 2 and the core 3. At the same time there is in the cavity 7 in the right of the two turnable middle parts 6' molded another part object 8 with material from that with the inlet 2' and the core 3' furnished movable mold part 9. The two part objects 4 and 8 consist on the drawing of two uniform half ball shaped shells, that later is intended to be put together to a hollow ball. It will be noticed, that this assembling will be eased by the outermost boundary surfaces 10 and 11 on the respective part objects 4 and 8 exceed out from the turnable middle parts. This is accomplished by there are similar undercuts 12 and 12' in respectively the stationary mold part 1 and the movable mold part 9. As it appears from the figure both the turnable middle parts 6 and 6', which in principle has a square formed section, have got their corners removed, so that they require a lesser opening of the tool for being able to turn around. Finally shall be mentioned, that identical cross sections of the on the figure showed can be seen e.g. five places underneath the shown, if the tool is designed for producing in total six assembled objects pr. cycle.

In fig. 2 is shown the same section, but where the two turnable middle parts 6 and 6' both are turned 90 degrees in the direction of the respective arrows, whereby the two part objects 4 and 8 have reached the on the figure highest position. Here heat is applied on their respectively boundary surfaces 10 and 11 from the movable heat units 13. The tool is meanwhile preferably closed, and the two subsequent part objects 4'

and 8' are just being molded through the two inlets 2 and 2' and the cores 3 and 3' in respectively the stationary mold part 1 and the movable mold part 9.

Fig 3 shows the same section, where the two turnable middle parts 6 and 6' both are turned additional 90 degrees in the direction of the respective arrows. The tool is here open, but moving towards closing, where the two part objects 4 and 8 will approach their two respective heated boundary surfaces 10 and 11 to each other before the welding together. The two following part objects 4' and 8' are now in their on the figure highest position, where they are receiving heat on their respective boundary surfaces 10' and 11' from the movable heat units 13. Finally the third set of part objects 4'' and 8'' are just being molded in the mold cavities 5'' and 7'', both the part objects are finished and ready for being turned away from their respective cores 3 and 3'.

On fig. 4 the two turnable middle parts 6 and 6' are turned another additional 90 degrees. Here the tool is closed, and the two part objects 4 and 8 now are melted together to the finished object, the hollow ball 4+8, which on the figure just is being ejected from the tool. It is noticed, that possible surplus material 14 suitably only exists on the inner side of the ball shell. The two following part objects 4' and 8' are here seen during the welding of their boundary surfaces 10' and 11' in the closed mold, and the third set of part objects 4'' and 8'' is getting their respective boundary surfaces 10'' and 11'' heated by the movable heating units 13. Finally has the fourth set of part objects 4''' and 8''' just been molded at their respective cores 3 and 3'.

Hereby the first sequence of the two turnable middle parts 6 and 6' is terminated. By the next turning of 90 degrees a new molding- and assembling cycle is started, as the first, where all four sides of each of the two turnable middle parts 6 and 6' are in full function. Hereafter a continuous production of part objects and the assembling hereof can continue after the same principles.

The on the drawing shown is just a single example of how the procedure and the machinery of the invention can be realized. This should however be sufficient to show the fundamental principles of the invention.

However there could also have been shown other versions of the procedure and the machinery according to the invention. Thus could the two object parts after their assembly ... a bottle or another kind of container. This can be realized by the turnable middle parts in stead of the on the drawing shown cavities have outgoing cores/core parts, which could make the design of the opening of the bottle. It will likewise be seen, that more technical objects with a difficult geometry preferably could be produced after the procedure according to the invention, which in all respects provides entire new possibilities for the designing of molded objects.

It shall also be noticed that the on the drawing shown step by applying heat possibly can be avoided, if e.g. the material, the design of the object or the velocity of the movement allows this. This is e.g. also the case, if the part objects solely have to be assembled by a pure mechanical assembling, such as a snap- or click function. E.g. instead of the step in the movement, where heat is applied, the part objects can be supplied with other things, such as electronics, fluid or metal parts, which shall be included in the assembled object.

## Claims:

1. Procedure and machinery for molding and assembling of an in at least two part objects (4) and (8) molded object (4+8) preferably of plastics in a tool comprising at least one turnable and/or displaceable middle part (6), characterized by the fact, that there in at least one of the boundary surfaces to the preferably two turnable middle parts (6) and (6') of the tool, which are furnished with turnable/displaceable cavities in the mold (5) and (7) and/or cores (3) and (3'), occurs an assembling of at least two parts (4) and (8) of the in the tool molded object(s), preferably when the tool is closing.
2. Procedure and machinery as mentioned in claim 1, characterized by the fact, that the tool, which molds the object/objects, preferably has two turnable middle parts (6) and (6') with separate part objects (4) and (8), which enables a continuous assembling of the part objects to the finished object(s) in the contact surface between the two turnable middle parts (6) and (6'), simultaneously as the new part objects (4'') and (8'') are being molded at the two opposite surfaces of the middle parts.
3. Procedure and machinery as mentioned in one or more of the previous claims, characterized by the fact, that the tool which molds the objects has preferably two turnable middle parts (6) and (6') with a preferably 90 degrees stepwise and opposite rotating turning of the middle parts, which enables an extra molding in the parting line of the object, in a way where this occurs in a preferably 90 degrees angle in relation to the closing movement of the tool.
4. Procedure and machinery as mentioned in one or more of the previous claims, characterized by the fact, that the tool which molds the objects preferably has two turnable middle parts (6) and (6'), which means it is constructed as a sandwich mold with three layers with a preferably 90 degrees stepwise turning of the turnable middle parts, which enables you to apply to the contact surfaces of the object heat or another kind of assembling media such as glue, in a position preferably in a right angle to the closing movement of the tool and preferably while the tool is closed, whereby the tool in this way simultaneously can be occupied by molding new part objects as well as assembling the part objects to finished objects.

5. Procedure and machinery as mentioned in one or more of the previous claims, characterized by the fact, that in the tool surface, where the two part objects (4) and (8) may be assembled, furthermore at least one material is molded/added on and/or in the assembled object.

6. Procedure and machinery as mentioned in one or more of the previous claims, characterized by the fact, that the finished object(s) are ejected/removed while the tool is closed, in an angle of 90 degrees in relation to the closing direction of the tool, which saves cycle time.

7. Procedure and machinery as mentioned in one or more of the previous claims, characterized by the fact, that the turnable middle part(s) (6) and (6') are turned 180 degrees in each cycle.

8. Procedure and machinery as mentioned in one or more of the previous claims, characterized by the fact, that there in the right angle position in relation to the closing direction of the tool is added an extra content to the part objects of the subsequently assembled object, e.g. electronics, fluid or metal parts.

9. Machinery for the molding of an object as mentioned in one or more of the previous claims, characterized by the fact, that there exists an ejector or a stripper plate in the stationary part 1 and/or in the movable part 9 in order to place/keep the objects in the middle part/middle parts.

10. Machinery for the molding of an object as mentioned in one or more of the previous claims, characterized by the fact, that at least one of the part objects in one of the turnable units is larger than the cavity and/or the core, where it/they is placed, which enables the assembling of the part objects, when the tool is closing, as it hereby becomes possible for two part objects to meet, so the assembling can take place.

Fig. 1

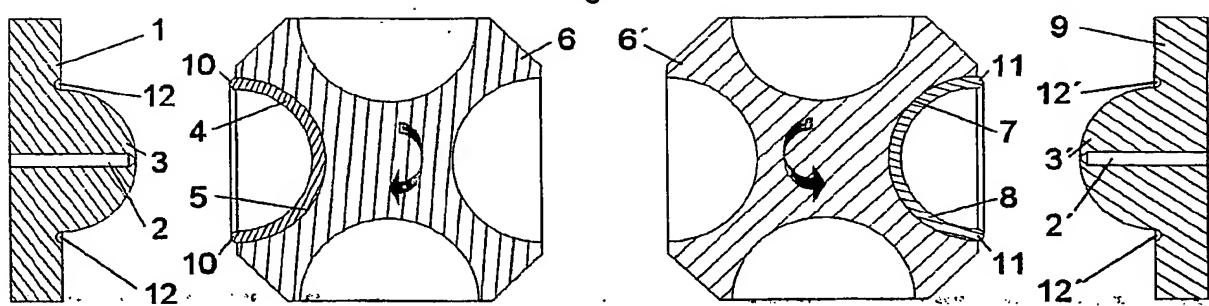


Fig. 2

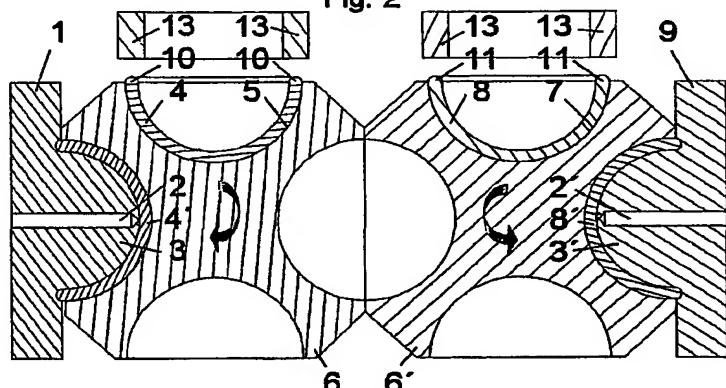


Fig. 3

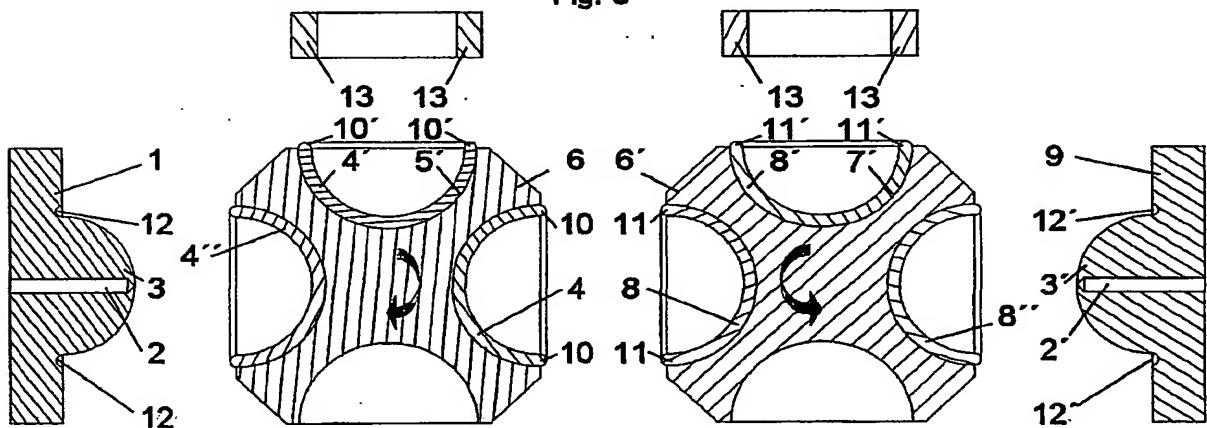
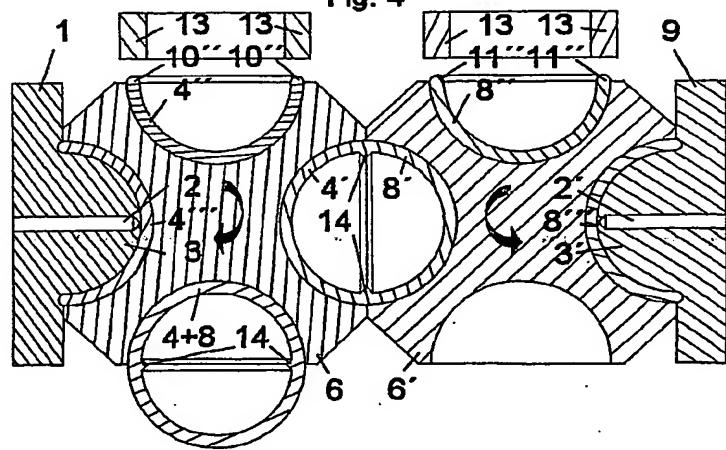


Fig. 4



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 01/00699

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B29C 45/04 // B29C 45/08

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPDOC, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9835808 A1 (GRAM, JES, TOUGAARD), 20 August 1998 (20.08.98), figures 1,2,3, abstract  --	1-10
P,X	WO 0073040 A1 (GRAM, JES, TOUGAARD), 7 December 2000 (07.12.00), figures 1,5, claim 1, abstract  --	1-10
P,X	WPI/Derwent's abstract, Accesion Number 2001-568427, week200164, ABSTRACT OF JP, 2001205681 A (TOYOTA JIDOSHA KK), 31 July 2001 (31.07.01). Figures 1,2; abstract.  --	1-10

 Further documents are listed in the continuation of Box C. See patent family annex.

- \* Special categories of cited documents:
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- "E" earlier application or patent but published on or after the international filing date
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- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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Date of the actual completion of the international search

1 February 2002

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 01/00699

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WPI/Derwent's abstract, Accession Number 1999-074523, week 199907, ABSTRACT OF JP, 10314343 A, (SUMITOMO RUBBER IND LTD), 02 December 1998 (02.12.98); figures 3,4; abstract	1-10
A	WO 9838021 A1 (GRAM, JES, TOUGAARD), 3 Sept 1998 (03.09.98), figures 1-4, abstract	1-10

**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

International application No.

PCT/DK 01/00699

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		JP 2001513038 T		28/08/01
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